February-March 1970

EMO

Canada-U.S. Health Manpower Exchange
Civil Emergency Planning in Germany
C.D. Budgetting in France
What we Must Do
The Military's Role in C.D. {U.S.}
Blast Shelter Evaluation
Index-1969

CANADA EMERGENCY MEASURES ORGANIZATION

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CANADA-U.S. HEALTH MANPOWER EXCHANGE

Introduction

by
F. T. Tomkins,

Emergency Health Service
Department of National Health and Welfare

Emergency Health officials of Canada and the United States recognized that there might be many occasions, following an attack on North America, when health personnel of either country would be located in the other country. There might also be situations where, in adjacent territories across the border, there could be a severe shortage of health personnel on one side and an adequate supply on the other. In peace-time, certain professional and other barriers prohibit the cross-border movement and employment of such personnel.

Officials of the two departments began discussions to facilitate the effective employment of all available health personnel in either country, in an emergency, and to encourage regional Emergency Health planners on both sides of the border to cooperate in planning.

As a result of these discussions a draft agreement was prepared by the (then) Division of Health Mobilization (DHE&W) and Emergency Health Services Division (DNH&W). The exchange of information on this and subsequent drafts continued for the next two years or so, interrupted by changes of personnel and terminology, and by a revision of the basic agreement on cooperation in civil emergency planning between the two countries.

Other interested Departments in the US and in Canada concurred in the terms of the Memorandum; the Canadian Provinces and States of the United States indicated agreement in principle in 1968.

After several minor changes in terminology, the two Emergency Health Services Divisions agreed to its content in January 1969. It was then passed to the national members of the US/Canada Joint Committee for consideration at their meeting in June 1969. Following the approval of this Committee, the agreement was signed by the Honorable John Munro, Minister of the Department of National Health and Welfare, and by the Honorable Robert E. Finch, Secretary Health, Education and Welfare in September 1969.

The intent of the Memorandum, as an administrative arrangement between the two federal departments charged with Emergency Health Planning at the federal level, is:

(a) to encourage the development of compatible plans and procedures for the exchange of health manpower, through cooperation, especially in adjacent jurisdictions along the US/Canada border,

(b) to encourage the removal or lessening, for the period following an emergency, of any legal or licensing impediments to cross-border assistance,

(c) to set out, in outline only, proposed channels of communication to facilitate cross-border working relationship.

The Memorandum encourages provinces and states to develop compatible plans, not joint plans, and emphasizes the necessity for local plans in either country to conform with wider regional plans of which the local jurisdiction is a part.

Memorandum of Understanding Between Department of Health, Education and Welfare of the United States of America and the Department of National Health and Welfare of Canada Regarding The Exchange of Health Manpower in the Event of An Armed Attack on Either Country in North America

Preamble

There is generally a shortage of trained health manpower to meet normal health requirements. The increased need fo such manpower in time of disaster would make this shortage critical. Because the effects of an enemy attack on either or both of our countries would not be limited by boundaries, this memorandum has been prepared to facilitate the post-attack exchange of health manpower to care for the sick and injured and to alleviate and prevent the spread of health hazards.

1. Purpose

The purpose of this memorandum is to:

A. Set our the agreed policy guidelines to be used in the development of compatible plans and procedures for the exchange of health manpower between Canada and the United States of America.

B. Encourage co-operative US/Canadian emergency health planning by the appropriate health authorities, within their respective jurisdictions, of those states, provinces and municipalities which are adjacent to one another along the International Border.

C. Assist in the removal of any serious potential impediments to cross-border assistance or emergency operations.

D. Delineate levels of responsibility and the channels of communication for the maintenance of cross-border working relationships in emergency health manpower planning and operations.

2. Scope

A. Health services are the responsibility of each state and province. Because of this, and the great variety of health disciplines, it would be unrealistic to attempt to cover all of them. The application of this memorandum will therefore be limited to those professions and occupations listed in the Annexure hereto, for which a common standard is acceptable to both countries.

B. Operational procedures in this memorandum will be effective only in a post-attack period. They will apply both to mutual support for dealing with a common survival problem and to the provision of health services, if necessary, for groups of refugees who may have crossed the International Boundary, voluntarily or by direction, to escape the effects of nuclear attack.

3. Authority

This memorandum shall constitute an administrative arrangement between the Department of Health Education and Welfare of the United States of America and the Department of National Health and Welfare of Canada, providing for co-operation and joint procedures for mutual assistance in civil emergency health planning. The arrangement is made pursuant to, and in accordance with the terms of, the "Agreement on Co-operation Between the United States and Canada on Civil Emergency Planning" concluded in Ottawa on August 8, 1967, and is subject to any superceding Agreement between the two governments. The implementation of the arrangement shall not be inconsistent with the overall manpower policy of each government in effect from time to time. Any proposed variation of the provisions of this memorandum must be within the terms of the basic agreement, and mutually agreed to by the two government departments.

4. Legislation

Federal Health officials shall encourage all states and provinces, especially those along the International Boundary, to prepare or revise necessary legislation regarding licensure to facilitate the exchange of health manpower in a post-attack period. Specifically, they shall use their best efforts to ensure that:

A. Reciprocity will be temporarily accorded licensed health practitioners who cross the International Boundary to perform emergency health services, and

B. Members of the recognized health and medical professions practicing healing arts in the post-attack period will be immune from professional liability suits except in cases of wilful misconduct, gross negligence, or bad faith.

5. Operational Procedures

If national priorities in either country—including the requirements of the Armed Forces—permit the exchange of health manpower, emergency health officials of both countries shall be guided by the following general procedures.

A. *Direction:* Health personnel shall, while in the other country, be under the functional direction of the emergency health authority in charge of emergency operations in the area in which they are serving.

B. *Pay:* Arrangements may be made for reimbursement or direct payment of individuals by the host country.

C. *Channels of Communication:* Transborder communication shall be between US and Canadian Regional headquarters, adjacent border municipalities, and political or command sub-divisions. Within each country health service officials will report upward, through their channels, action taken or additional health manpower needed to comply with a request from the other country.

6. Issuances

It is agreed that:

A. Each of the government departments concerned shall routinely provide to the other all pertinent emergency issuances. Proposed orders, instructions or directives which might directly affect the other country, or state or province of the other country, shall be submitted to both the

federal department and the state or province concerned for review and clearance prior to publication or release.

B. Statements of new or revised policy affecting both countries will be made simultaneously at an agreed time.

7. Planning

In planning for the exchange of health manpower, officials of both countries shall with appropriate consultation with manpower officials be guided by the following policies:

A. *Federal:* National and headquarters plans shall be developed for the Department of Health, Education and Welfare by the Director, Division of Emergency Health Services and for the Health Branch of the Department of National Health and Welfare by the Chief, Emergency Health Services Division.

B. *Regions and Provinces:* Compatible regional emergency health plans shall be developed by the Regional Health Directors, USPHS and the Directors, Provincial EHS where regions and provinces are contiguous. New or conflicting policy matters shall be referred to the respective federal offices for action.

C. *State/Provinces:* Plans, developed by the responsible health officials of contiguous states and provinces shall conform with national plans, and have the concurrence of the responsible civil defence and emergency planning officials.

D. *Municipalities:* Plans, developed by the responsible health officials of adjacent municipalities, shall conform with State and Provincial emergency health plans and have the concurrence of the responsible civil defence and emergency planning officials.

For the Department of National Health and Welfare
JOHN MUNRO
Minister

For the Department of Health, Education, and Welfare
ROBERT E. FINCH
Secretary

SCHEDULE OF HEALTH MANPOWER

United States Title	Canadian Title
Administrator, Hospital	Hospital Administrator
Anatomist	Anatomist
Audiologist	Audiologist
Audiometrist	Audiometrist
Bacteriologist—Dairy	Dairy Bacteriologist (Note 1)
Bacteriologist—Fishery	Fishery Bacteriologist
Bacterologist—Food	Food Bacteriologist (Note 1)
Bacteriologist—Medical	Medical Bacteriologist
Bacteriologist—Pharmaceutical	(No Canadian Equivalent)
Bacteriologist—Public Health	Bacteriologist
Biochemist	Biochemist
Biophysicist	Biophysicist
Chemist, Biological	Chemist, Biological
Chemist, Clinical	Chemist, Clinical
Chemist, Enzymes	Chemist, Enzymes
Chemist, Pharmaceutical	Chemist, Pharmaceutical
Chemist, Proteins	Chemist, Proteins
Chemist, Steroids	Chemist, Steroids
Chiropodist	Chropodist and Podiatrist (both terms used in Canada)
Cytologist, Animal	Cytologist, Animal
Dentists	Dentists
Food and Drug Inspector (Govt. Ser.)	Food and Drug Inspector
Health Physicist	Health Physicist
Hearing Clinician	Hearing Clinician
Helminthologist	Helminthologist
Histologist	Histologist
Histopathologist	Histopathologist
Hospital Administrator	Hospital Administrator
Hygienist, Dental	Dental, Hygienist

United States Title	Canadian Title
Immunologist	Immunologist
Instructor of Blind (also Orientation Therapist for the Blind)	Instructor of Blind
Librarian, Medical-Record (Med. Ser.)	Medical Record Librarian
Medical Assistant	Medical Assistant
Medical Laboratory Assistant	Medical Laboratory Assistant
Microbiologist	Microbiologist
Midwife	Obstretrical Nurse
Nurse Aid (Med. Ser.)	Nurse Aide or Ward Aide
Nurse, Licensed, Practical	Registered or Certified Nursing Assistant
Nurse, Registered	Registered Nurse
Optometrist	Optometrist
Orderly (Med. Ser.)	Hospital Orderly
Orderly, Surgical	Hospital Orderly
Orthopedic Specialist	Orthopedic Specialist
Orthoptist	Orthoptist
Osteopathic Physician	Osteopath
Parasitologist, Medical	Parasitologist
Pharmacist	Pharmacist
Pharmacologist	Pharmacologist
Physicians and Surgeons	Physicians and Surgeons
Physiologist, Animal	Physiologist, Animal
Physiologist, Medical	Medical Physiologist
Podiatrist	Chiropodist and Podiatrist (both terms used in Canada)
Prosthetist-Orthotist	Prosthetist-Orthotist
Protozoologist	Protozoologist
Psychologist, Clinical	Psychologist, Clinical
Public-Health Bacteriologist	Bacteriologist
Public Health Engineer	Public Health Engineer
Sanitarian (Profess. & Kin.)	Public Health Inspector
Sanitary Engineer	Public Health Engineer
Serologist	Serologist
Sewage-Disposal Engineer	Public Health Engineer
Social Worker, Medical (Profess. and Kin.)	Medical Social Worker (Note 1)
Social Worker, Psychiatric (Profess. and Kin.)	Social Worker, Psychiatric (Note 1)
Speech and Hearing Clinician	Speech Therapist
Speech Pathologist	Speech Pathologist
Superintendent, Hospital (see also Hospital Administrator)	Hospital Administrator or Medical Administrator
Technicians	
Audiometric Technician	Audiometric Technician (also Hearing Test Technician)
Blood-bank Technician	Blood-bank Technician
Cytotechnician	Cytology Technician
Dental Laboratory Technician	Dental Technician
Dental Technician	Dental Technician
Electrocardiograph Technician	(No Canadian equivalent)
Electroencephalograph Technician	(No Canadian equivalent)
Hearing Test Technician	Hearing Test Technician (also Audiometric Technician)
Hematology Technician	Haemotology Technician
Laboratory Technician, Veterinary	Laboratory Technician, Veterinary
Medical Technician	Medical Technician
Obstetrical Technician	(No Canadian equivalent)
Operating Room Technician	Operating Room Technician
Orthodontic Technician	Dental Technician
Orthopedic Appliance-and-Limb Technician	Orthopedic Appliance-and-Limb Technician
Orthoptic Technician	Orthoptic Technician
Oxygen-Therapy Technician	(No Canadian equivalent)
Serology Technician	Serology Technician
Surgical Technician	Operating Room Technician
Tissue Technician	Tissue Technician

United States Title	Canadian Title
Technologists	
Biochemistry Technologist	Biochemistry Technologist
Blood-bank Technologist	Blood-bank Technologist
Cytotechnologist	Cytology Technician
Hematology Technologist	Haematology Technician
Histopathology Technologist	Histopathology Technologist
Medical Technologist	Medical Technician
Medical Technologist, Bacteriology	Medical Technologist, Bacteriology
Medical Technologist, Chemistry	Medical Technologist, Chemistry
Medical Technologist, Histology	Medical Technologist, Histology
Microbiology Technologist	Microbiology Technologist
Nuclear Medical Technologist	Nuclear Medical Technologist
Radioisotope Technologist	Radioisotope Technologist
Radiologic Technologist	X-Ray Technician
Serology Technologist	Serology Technologist
Tissue Technologist	Tissue Technologist
X-Ray Technologist	X-Ray Technician
Therapists	
Inhalation Therapist	(No Canadian Equivalent)
Occupational Therapist	Occupational Therapist
Orientation Therapist for the Blind	Instructor for the Blind
Physical Therapist	Physical Therapist
Physiotherapist	Physiotherapist
Veterinarian	Veterinarian (Note 1)
Virologist	Virologist

Canadian occupational titles for which no United States equivalents are listed:

Health Educator
Hospital Dietitian (Note 1)
Psychiatric Nurse (Note 2)
Chiropractor
Toxicologist

Note 1.

In Canada, all civilians will be subject to Emergency Manpower Regulations. All health occupations listed, except those noted, will be allocated to Emergency Health Services for direction and control. Those noted *may* be directed to emergency health employment depending on the priorities at the time, and the possible need for them in other occupations (e.g. Emergency Welfare Services).

Note 2.

In Canada, one who has completed a course of 2 or 3 years in a mental hospital and is prepared to nurse psychiatric patients.

CIVIL EMERGENCY PLANNING IN GERMANY

by
Ulrich Eischstädt

President of the German Civil Emergency Planning Academy, Federal Republic of Germany, Bad Godesberg.

It is the primary objective of Western policy to avoid war, i.e. to reduce the existing international tension. However, as it is not certain that this aim can be reached, Western policy must, at the same time, be able to deter any potential aggressor. This policy of deterrence requires that our own defence preparedness should be so great than any aggressor would run the risk of being annihilated by the retaliatory strikes of the West.

These considerations are, of course, primarily true of military defence. Civil emergency planning alone, however good it may be, does not deter anybody since no damage can be inflicted by it on the aggressor.

However, it should not be overlooked that any increase of the military deterrence would be impossible if civil emergency planning were neglected. A few examples illustrate this point. The calling-up of reservists requires that letters are still being forwarded; the requisitioning of reserve equipment on mobilisation would be impossible without the co-operation of the civil authorities in the registration and taking-over of the equipment; the transmission of alerts and the requisite orders as well as of information on the situation as it develops require an efficient communications network; mobilisation, as being one of the most important conditions for the deterrent function of the military effort, requires, among other things, the availability of an efficient road network through the efforts of the civil road construction agencies, police action to keep away non-essential traffic from the roads, and action by civil authorities to control the refugee problem; if the logistical side—being a national responsability—is to function properly, the national potential must be fully exploited by the economic administrations (such as for fuel, spare parts, medical supplies, etc.) and the civil manpower requirements of the forces (workers in the depots, nursing staff for the hospital organisation, etc.) must be met by civil organisations, especially the labour exchanges.

ABOUT THE AUTHOR

From 1959 to 1966, Ulrich Eichstädt was the head of the Section co-ordinating Civil Emergency Planning in the Federal Ministry of the Interior. He has been President of the German Civil Emergency Planning Academy since 1966. The Academy's task is to train civil servants responsible for Civil Emergency Planning as well as experts from industry in the overall context of Civil Emergency Planning.

Without these and many other precautions which should be taken in peacetime, the fulfilment of the military requirements in case of an alert or in an emergency will not be possible. If the military requirements for civil support cannot be met, the effectiveness of military defence and thus of the deterrent becomes questionable. Without a credible deterrent, peace is in danger. This is the political importance of civil emergency planning. It should never be overlooked that military defence loses its meaning if the civil population becomes a victim of warfare because adequate civil precautions had not been taken. For, what would there be left to defend if the substance of a nation is annihilated?

We should be under no illusion: the existing shortcomings of civil emergency planning may have dangerous consequences for our security policy. The interrelationships between an effective civil emergency planning and a credible deterrent are apparently not always clearly recognised.

The Need for such Planning

The need to ensure the protection of the civil population in time of war is a fairly recent phenomenon. For a long time, war was understood as being a conflict between armed forces but as it developed into an all-embracing struggle between nations, the need for civil emergency planning arose. Thus, military defence must be complemented by defensive action in the civil field.

At the same time, another development has taken place. The balance of power in the world changed decisively after the second World War. Nowadays, the security of the Federal Republic can no longer be ensured on the basis of national resurces alone. Like other European countries, it depends on a comprehensive alliance system which safeguards its security. Thus the defence of the Federal Republic forms part of the defence of NATO. Naturally, this does not only apply to military defence but also to the defence of the civil population.

Definition and Objectives

Today, we sum up military defence and civil emergency planning under the heading "overall defence". This term covers all our efforts to ensure our security. Owing to the Fedral Republic's membership of NATO, military defence and civil emergency planning are

divided into a national and a NATO sector. The civil side, too, has to fulfil important functions in the NATO sector. But for the subject under discussion, it is the national sector of civil emergency planning which is in the foreground.

In the national field, civil emergency planning has to deal with four major problem areas.

The first of these is Civil Defence. This term comprises all measures designed to protect the civil population from the effects of war and to eliminate or mitigate its consequences. It would include, self-protection; warning and alert service; Civil Defence units; shelter construction; controlling population movements; health services; and the protection of cultural assets.

The construction of shelters forms the cornerstone of civil defence because the survival of at least the greater part of the civil population can only be ensured by shelters. Without them, the stay-put policy cannot be enforce. It is, therefore, all the more dangerous that no satisfactory solutions have been found up to now in this respect. In the present situation, the problems of conducting military operations in the forward combat zone are bound to become exceedingly difficult.

The second problem area concerns supplies, i.e. steps to ensure the availability of indispensable goods and services and of the necessary manpower to the civil population and to essential users.

If we want to be able to maintain supplies of food, water, energy and the essential industrial items, we need people, protective structures for the most important installations, reserves as well as plans for rationing and the control of production and distribution. We also need considerable transport services and the maintenance of postal and telecommunications links.

The importance of this task can hardly be overestimated. We should not lose sight of the fact that military defence depends to a great extent on these services. In the case of the Federal Republic, there is—in addition to the military forces—a civil population of about 59 million people who must be supplied with the most essential goods and services in an emergency. This figure alone indicates the magnitude of the task which must be mastered by civil emergency planning.

The third problem area is that of supporting the military defence effort. Many activities designed to create and maintain the operational capability and freedom of the armed forces are a matter for the civil sector. Thus problems of a new kind arise in the cooperation between civil and military agencies for which there is no precedent in the history of Germany.

Finally, the fourth problem is that of maintaining government control. The functions described above can only be carried out if the government continues to be able to exercise control. Otherwise, there would be no possibility of taking political decisions, enforcing them, controlling the deployment of civil and military forces, and ensuring the availability of supplies to the civil population and the armed forces.

The maintenance of government control comprises measures to protect legislative procedure, the activities of the courts of law, governmental control and administrative functions, the maintenance of law and order by the police forces, and the continued functioning of information media.

To ensure all this, we need practicable constitutional arrangements, a number of simple laws, many administrative plans and precautionary measures, and a good deal of money.

This description should make it abundantly clear how important and far-reaching civil emergency planning is for the survival of a country's population.

The Legal Basis

What conditions must be met if the problems set out above are to be solved? The legal basis must be created to enable the competent authorities to take the necessary action in an emergency. As far as the Federal Republic of Germany is concerned, laws are needed for three main reasons: the federal structure of the Republic and the far-reaching administrative autonomy of local authorities require the assignment of tasks to the various authorities by means of laws; the fact that the Federal Republic is founded on the rule of law as well as the principle of the legality of public administration makes it necessary that duties essential for the defence of the country must be imposed on the individual, as well as on the private economy, through laws; the financial and budgetary system of the Federal Republic requires legislative arrangements for the sharing and accounting of costs.

In the past, numerous problems of civil emergency planning could not be solved because the necessary legal basis had not been created, but since the summer of 1968, this situation has improved. Without wishing to go into details, I should like to give a short survey of the present state of affairs.

The promulgation of the "Emergency Constitution" closed a serious gap in the maintenance of governmental functions. It restored full sovereignty to the Germain government, which had still been subject to the rights which the allied powers of the second World War had reserved to themselves in Article 5 of the "Convention on Relations between the Three Powers and the Federal Republic of Germany". We now possess the necessary constitutional basis for legislation concerning manpower requirements and the restriction of the secrecy of mail and of posts and telecommunications; arrangements have been made in case of a state of internal emergency and of emergencies resulting from natural catastrophes. Under these arrangements, the details and limitations of an intervention by the German armed forces and the Federal Frontier Police have been laid down. Finally, the Emergency Constitution contains provisions on the competence and responsabilities in times of international crisis, in

times of tension (i.e. during the alert phase) and in an actual emergency.

This last point is of special significance. By the insertion of a paragraph (a) into Article 80 of the Constitution, the full application of the majority of simple laws was made dependant on the approval of Parliament or the explicit declaration of a state of tension. The only exception applies if these laws must be used as a result of an alert declared by NATO. However, this exception is not valid if additional manpower is to be requisitioned outside the law on military conscription, so that the compulsory recruitment of manpower in any case requires a two-thirds majority of Parliament. These arrangements are of the greatest importance for those alert planning stages which must be carried out in times of peace. The main characteristic of the Emergency Constitution is the maintenance of full parliamentary control which may pass over to the so-called "Joint Committee" in an emergency, but only if parliament as such is unable to act.

As far as legislation designed to meet material requirements is concerned, there has been, for a long time, the Law on the Requisitioning of Goods and Services and it is fully applicable to civil emergency planning. It permits the direct requisitioning of individual goods and services but does not provide for any control measures. The Law on the Maintenance of the Water Supply provides for all necessary measures to ensure the supply of water, the disposal of sewage and the protection of water reservoirs. It is fully applicable in times of peace but depends in practice on the availability of budgetary funs. The Laws on the Maintenance of the Food Supply, the Economy and Transport Facilities provide for the necessary detailed arrangements in these fields but they are not fully applicable since they require the enactment of Regulations. The application of the latter must await the approval of Parliament, the declaration of a case of tension or the announcement of a NATO alert (Article 80 (a) of the Constitution.) As far as the fulfilment of manpower requirements in the civil sector is concerned, the situation is much less favourable than in the military field since the armed forces can make use of the conscription law which is, by and large, fully applicable in times of peace.

The most important legal basis for meeting personnel requirements in the civil sector has been, since the summer of 1968, the Law on Safeguarding the Supply of Manpower. Its enactment required the amendment of Article 12 on the Basic Law by the Emergency Constitution. In times of peace, however, this law only permits administrative preparations and, to a certain extent, the training of specialists (especially for civil defence and the police).

The legislative basis for Civil Defence was created by the adoption of two highly important laws in 1965. However, they were suspended in the same year. They are the Law on the Civil Defence Corps, the object of which was the establishment of civil defence units along military lines for regional employment, and the Law on Shelter Construction; this law primarily provided for commitments for the construction of basic protection shelters in new buildings and more sophisticated structures in special buildings.

The fact that the Shelter Construction Law was suspended in 1965 constitutes the most serious difficulty for civil emergency planning and we are here faced with a decisive gap. The suspension was caused by budgetary problems but the Federal Ministry of the Interior is at present renewing its efforts to find a solution to this problem.

A Law on the Extension of Protection against Natural Catastrophes was adopted in the summer of 1968. Its essential provisions concern the merging of the local protection organisation against natural catastrophes with the former civil defence services. This law creates the legal basis for decrees issued to enforce the stay-put policy and for the introduction of population movements, such as when particularly endangered areas are to be evacuated. However, this latter measure is again subject to approval of Parliament, the declaration of a state of tension or a NATO alert. In addition, there are two paragraphs on the self-protection of the civil population which will continue to be ensured on a purely voluntary basis. The Self-Protection Law of 1965, which went much further, has been suspended.

Finally, mention should be made of the First Civil Protection Law of 1957 which is, however, now only of importance for some aspects of civil defence, especially for the warning and alert services, the stock-pilling of medical supplies and the protection of cultural assets.

Summing up, it may be stated that the legal basis is now in existence for large parts of civil emergency planning. However, it should not be overlooked that the laws designed to safeguard the food supply, the economy and transport services require the enactment of Regulations before they can be utilized. Civil defence legislation in the Federal Republic of Germany is still unsatisfactory. Major gaps in the original concept have been caused by the suspension of the Shelter Construction Law and the Law on the Civil Defence Corps.

I also regard as necessary a Law Safeguarding the Health Services since no arrangements have been made in this respect with a view to an emergency. Another law which I consider to be of urgent importance are Laws for Compulsory Service in the Police and the Federal Frontier Service, as the police potential is undoubtly insufficient in case of alert and considerable efforts are still necessary to improve public safety.

In spite of these gaps and the criticism of the existing laws it must, nevertheless, be admitted that civil emergency planning has made a great step forward in the Federal Republic thanks to the legislative measures undertaken in 1968.

The Organization

What must be considered now is the organisational structure adopted by civil emergency planning in order to solve its problems within the legislative framework described above. Apart from some aspects of civil defence, the control and administrative machinery required by civil emergency planning is, for the most part, in existence, although it is predominantly occupied with normal peacetime functions. However, it can be said that hardly any new agencies will have to be established in emergency. The problem rather is to impose on the peacetime machinery preparatory functions which are not regarded as unimportant and thus largely neglected; and to adjust the existing organisation to the requirements of an actual emergency.

In the adjustment of our peacetime organisation to the requirements of an emergency we should observe and enforce four principles. The first is the creation of of uninterrupted chain of command. This is necessary so as to be able to co-ordinate in peacetime the civil planning of the central agencies with the national and international military measures and to implement these plans uniformly in an emergency.

In Germany, this is difficult to achieve in view of the existence of three basically autonomous levels of government (Federal Government, Länder governments and local authorities). The more recent laws, therefore, provide that civil emergency planning is a matter for the Federal Government. This has made it possible to create an uninterrupted chain of command from the Federal Government via the Länder to the local authorities.

The second principle concerns deconcentration, i.e. the delegation of power to the lower administrative levels. In the Federal Republic, the administration is decentralised at the lowest level over the whole area of the country so that the likelihood of maintaining its capability to act is greatest. The principle of deconcentration will have to be borne in mind especially when the necessary Regulations are enacted.

The third principle is that of concentration, i.e. the centralisation of as many administrative responsabilities as possible at the same administrative level. The need for concentration—or, in other words, the creation of administrative uniformity—arises out of the dispersal of administrative responsabilities to specialised agencies of the Federal or Länder governments. The centralisation of these various civil chains of command within the general internal administration is necessary because one single authority at each administrative level must have the right to issue instructions for uniform compliance; and differences of opinion must be decided in one single place because, in the short time which will be available, it will not be possible to refer problems of this kind to higher authority for decision, and lastly the military side requires one single authority to which it may address itself.

Thus, the precautionary legislation which has been enacted does not provide for the creation of separate chains of command for food, economy and road transport. The work necessary in these fields will have to be done by the medium-level regional and local authorities. However, there can be no question that there are limits to this form of concentration. Thus, administrative authorities having a nation-wide role, such as the railways of the PTT, or having entirely different functions, such as the courts of law, cannot be merged. In order, however to obtain a maximum of concentration in these cases, the creation of liaison groups is intended between these administrations and the general internal administration which is the main pillar of the civil defence organisations.

The fourth aspect, finally, concerns the principle by which collective bodies have no place in the civil defence command chain. This is not of any great importance for the Federal and Länder administrations since these are in any case organised along hierarchical lines. However, this is different for the local authorities. At a time of tension or in an emergency, it will not be possible to have decisions taken by committees or other collective bodies. What will be decisive is the speed with which decisions can be taken. Furthermore, responsabilities should be clearely defined. This is why all precautionary laws provide that the chief administrative officer of the local authority concerned shall be responsible for the implementation of all laws.

The Financial Basis

In addition to the necessary legislation and organisation, civil emergency planning also requires considerable financial resources. A study of the development of budgetary appropriations in the Federal Republic of Germany shows that civil emergency planning budget gradually increased until 1962; the point of culmination was reached in 1962 when a total of 786 million Deutschmarks were appropriated; budgets then gradually decreased again to 432 million Deutschmarks as part of the medium-term financial plans introduced for 1969 and subsequent years.

Actual expenditure for civil emergency planning from 1952 to 1967 amounts to 4,800 million Deutschmarks. Since the medium-term financial plans only provide for 432 million Deutschmarks per year until 1972, it hardly seems possible to carry out additional programmes.

However, civil emergency planning should not be looked at in isolation as it is inseparably connected with military defence. All the more serious is the disproportion between civil and military expenditure. In 1968, 2.4 per cent of the money spent on military defence was available for civil emergency planning. The highest percentage ever reached was in 1961 and amounted to 6.3 per cent, after which it declined more and more. In recent years, the percentage has fluctuated between 2.5 and 2.9 per cent of the military appropriations

continued on page 28 GERMAN

C.D. BUDGETTING IN FRANCE

Implementation of the Rationalization of Budgetary Options by the National Civil Defence Service

by
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The decision to apply rationalization of budgetary options (RBO) procedures, made by the Government in March 1968 on the recommendation of the Minister of Finance, prompted the Service national de la protection civile (SNPC) (National Civil Defence Service) to implement these techniques in close co-operation with the Administrative and Financial Affairs and Common Services Branch (AFACSB) responsible for promoting the new methods. From July 1968 to July 1969, the SNPC concentrated its efforts on three areas. It:

1. drew up a programme structure for civil defence in peacetime;
2. participated in a study of RBO aspects of the problem of highway accidents;
3. compared its method with the methodological research of the AFACSB No. 3 Team, composed of members of the Studies and Co-ordination Bureau assisted by engineers of the G2 Company, a subsidiary of S.E.M.A

The following is a report of the results obtained in these three areas.

Preparation of a Programme Structure by S N P C

The first concern was to systematically apply the principles of PPBS (planning, programming, budgeting system) to civil defence.

This involved:

1. Defining the missions, objectives and purposes of the SNPC with a view to questioning its traditional principles at an interministerial meeting;
2. Selecting means of ensuring minimum cost and maximum effectiveness;
3. Developing and establishing efficiency indicators (technical and economic);
4. Presenting a five-year programme (1971-1975) to be revised annually in the light of results recorded by the efficiency indicators;
5. Outlining these steps in a programme memorandum to ensure that the proposed measures will be carried out by all services involved.

The results were as follows:

(a) The SNPC succeeded in defining its missions, objectives and purposes with regard to civil defence in peacetime.

A meeting is therefore possible both within the Ministry of the Interior and on an interministerial level with a view to eliminating the possible overlapping of missions and to facilitate interministerial co-ordination in carrying out missions common to several services or even several ministries.

(b) Selection of Means from Cost-Effectiveness Studies

It was found that the data bank established by the Ministry of the Interior covered only 5% of civil defence credits in peacetime since 95% of its financial resources come from local governments.

For the same reasons, the introduction of budgetary control management will not really shed light on the actual costs of the SNPC as these are mainly borne by local decentralized governments.

In view of these findings, the SNPC decided to:

1. Create a data bank which will cover both costs and technical effectiveness (which it will attempt to translate in terms of economic and financial effectiveness). Research into costs will be coupled with research into cost-effectiveness.
2. Undertake studies with a view to introducing budgetary control management in its services in order to assess all its costs.

In this regard, the SNPC will investigate the measures recommended for budgetary control management in the Ministry of the Interior in order to implement them in all the decentralized services of the SNPC. (if these measures are adopted by the Administrative and Financial Affairs Branch). It will thus be possible to introduce budgetary control management in the decentralized service of the SNPC. Only after it has gathered full data on costs and effectiveness will the SNPC be able to proceed with the selection of means based on cost-effectiveness studies.

(c) Efficiency Indicators

For obvious operational reasons, the search for greater effectiveness is of major concern to the SNPC services; the limited funds placed at its disposal necessarily prompt it to seek the lowest possible cost. It was thus possible to establish technical efficiency indicators. more difficult to determine economic and financial efficiency indicators from technical effectiveness. Nevertheless, the SNPC succeeded in establishing several indicators, financial and economic, as well as technical. In fact, recently completed research into the cost of injury and of human life makes it possible to translate technical effectiveness indicators into economic effectiveness, and to measure the economic gain resulting from SNPC activities, at least with regard to the protection of human life.

With systematic use of the data bank, research in this field will progress rapidly.

For the moment, progress is at a standstill owing to the fact that the technical efficiency indicators designed by the SNPC from the statistics of emergency services performed, are not available.

These statistics, which until 1964 were compiled by the Ministry of Equipment, are now furnished by the Ministry of the Interior's computer.

However, due to internal difficulties with regard to key-punching and programming, this work was not performed.

Because of this, the SNPC cannot measure the effectiveness of its activities for the 1964-68 period.

Such a situation cannot continue without serious detriment to the proper administration of the SNPC, since the director is thereby deprived of data essential for defining policy and checking the results obtained.

Should the Computer Organization Service of the Ministry of the Interior be unable to ensure processing of the 1965-1968 statistics during 1969, it would be advisable to request the necessary funds from the AFACSB in order to have the key-punching and programming done without further delay by a private firm.

In any event, commencing January 1, 1970, it is essential that the SNPC be in a position to use its operational statistics, and to study the efficiency indicators.

(d) Presentation of a Five-Year Programme

The lack of data on costs and effectiveness makes it impossible, for the moment, to draw up a five-year programme (1971-1975), based on cost-effectiveness studies, for all civil defence in peacetime.

Nevertheless, the SNPC made an effort to progress in this field, through research into two areas:

1. *Preparation of a 1971-1975 Programme by Conventional methods.*

First of all, for the 1971-1975 period it was possible to predict:

— developments in risks, economic losses resulting from accidents and disasters, and emergency service operations;

— changes in personnel, equipment and space requirements and financial resources, in general, for the same period.

Secondly, it was possible to measure the actual requirements of the emergency services taking into account the predictable changes in risks, losses and operations.

Comparison of the predicted evolution of means and actual requirements brought to light four deficits, in personnel, equipment, space and financial resources. These deficits will result in a now predictable serious loss of efficiency on the part of the emergency services and in an increase in demographic and economic losses during this period.

The development of this conventional programme will make it possible to repeat the same study from the RBO angle with a view to seeking greater effectiveness and less cost for the SNPC.

2. *Preparation of a Highway Emergency Programme by RBO Methods Within the Framework of the Highway Emergency Programme Category of the Civil Defence Programme Structure.*

This programme is designed as an alternative programme which may be compared with the highway safety activities carried out by the Ministry of the Interior (police, legislation) or with those planned by the Ministry of Equipment. Attention will be focused on comparing the cost and effectiveness of preventive and emergency measures. It will also be possible to compare the SNPC programme with that of the Ministry of Public Health: a comparison of two alternative programmes in the field of emergency action.

In the course of 1969-1970, the SNPC will be able to draw up similar RBO programmes for fire, asphyxiations, house fires and sundry operations which, along with highway accidents, constitute the essence of its operational missions. Subsequently, during 1970, the SNPC will be able to present its overall peacetime budget in RBO terms. It may then participate in an interministerial discussion of missions, which would

probably result in the re-examination of the services already voted.

It appears that the SNPC should be able to play a fundamental role in the re-examination of missions in interministerial discussions. Indeed, the SNPC has an interministerial co-ordination role, both for the prevention of disasters and for the organization of emergency services.

In the performance of this role, it attempts to obtain the maximum technical effectiveness in each ministerial branch involved.

Henceforth, it should also attempt to obtain the maximum economic and financial effectiveness and to systematically apply RBO techniques in order to achieve the greatest technical effectiveness at the least possible economic and financial cost.

Participation in the Highway Accidents Study

The SNPC actively participated in a highway accidents study because of the obvious usefulness of pilot action in this area; because the study would enable its personnel to apply RBO methods; and because the SNPC programme includes a category of "First Aid for Highway Victims".

This programme category was drawn up in the context of the highway study with a view to later comparison with the programme category which the Ministry of Public Health will undoubtedly present in the same area.

The pilot study for the rational preparation of decisions concerning highway accidents, under item 14, "First Aid for Victims, Warning, Emergency Services, Evacuation", accepted the definition of the objectives and purposes of highway emergency measures proposed by the SNPC in agreement with the Ministry of Social Affairs.

Agreement by these two ministries on the objectives and purposes to be achieved is an important accomplishment of the RBO method, making it possible to clarify the highway emergency services situation.

However, there is continuing disagreement between the two ministries with regard to the means required to attain these objectives and purposes at the lowest possible cost and at maximum effectiveness.

It therefore appears that the SNPC and the Ministry of Public Health should each draw up a programme category based on Cost-Effectiveness studies.

Comparison of these two categories should make it possible to determine those measures which will be the most effective and least costly.

As a third step, it would be advisable to make a comparison of highway emergency measures and prevention mesaures in order to determine which are the least costly and the most effective. This double step will make it possible to propose a fair distribution of financial resources—the very object of the rationalization of budgetary options.

In general terms, we may consider that the efforts put forth to define objectives and purposes have been most effective. It will apparently be necessary for the SNPC to be very closely associated with later steps, i.e.:

1. Comparison in cost-effectiveness terms of the measures proposed by the SNPC and those proposed by the Ministry of Public Health in matters of first aid to highway victims (highway emergency services);
2. Comparison in cost-effectiveness terms of prevention and emergency measures of the SNPC and Public Health, on the one hand, and the Ministry of Equipment (Local Governments Branch, Police, Gendarmerie and Regulations Branch) on the other.

Comparison of the RBO Method Applied by the SNPC with that Implemented by the AFACSB

(a) With regard to the establishment of a data bank and the implementation of budgetary control management, the two essential preliminaries to the systematic implementation of RBO, the SNPC was not called upon to compare its methods with those of the AFACSB; it was content to adopt the latter's methods in this area.

To this effect, it undertook:

1. To create a data bank which will cover all the financial data of the fire and emergency services

Four training sessions organized at the *Ecole de Nainville-les-Roches* made it possible to develop methods for data assembly which will result in the collection of more than 300,000 items of information on costs and effectiveness.

In addition, the SNPC requested the AFACSB to consider the gathering of data at the departmental level, rather than at the regional or zone levels. This would give the SNPC the advantage of being able to direct its data to the data bank of the Ministry of the Interior, so as to create a single data bank.

2. To implement budgetary control management within departmental fire and emergency services focusing on calculation of costs. Upon completion of the work it will be advisable to apply the method drawn up for the Ministry of the Interior to departmental fire and emergency services.

(b) The SNPC compared the RBO method which it applies (PPBS) with that of the team composed of officials of the Studies and Co-ordination Bureau.

As SNPC has marked considerable progress, since it has outlined its programme structure and has succeeded in presenting a programme category, "First Aid for the Injured", paving the way for a pluri annual programme (1971-1975), it became obvious that methodological comparison should be made of highway emergency services, rather than fire services on which work is now in progress.

The SNPC therefore summarized the steps it had taken:

1. The definition of the purposes and objectives of the SNPC for highway emergency within the framework of the purposes and objectives designated;
2. The establishment of technical efficiency indicators and economic and financial efficiency indicators;
3. The preparation of a five-year programme to be revised annually.

In the opinion of the SNPC:

1. The purposes and objectives of the SNPC should be compared with those of the Ministry of Public Health;
2. Regarding highway emergency services, the SNPC five-year programme must be compared with the Public Health programme in this field. The SNPC programme must also be compared with the prevention programmes of the Department of Equipment, local governments, police, gendarmerie and the Regulations Branch.

Determining the Purposes and Objectives of the S.N.P.C.

Objectives

As defined under the Pilot Study:

Ensure that highway victims are picked up by fire brigade emergency centres in areas where this can be done more effectively and at less cost than by hospital services.

Purposes

Through the implementation of these objectives during the 1971-1975 period, prevent the death of 14,000 persons injured in highway accidents in five years.

Establishing Efficiency Indicators

These will enable the SNPC to measure the length of time taken for emergency operations and to gauge their effectiveness.

Time Measure

1st Indicator: time taken to alert emergency services (time of accident, time police are notified)

2nd Indicator: time taken by emergency services before departing for victim

3rd Indicator: time taken to reach victim

4th Indicator: time spent with victim on the scene

5th Indicator: time taken to convey victim to hospital

These indicators will make it possible to measure the effectiveness of the operational grid set up by the SNPC. As the cost of the grid is known, a comparison will be possible with the grid proposed by the Ministry of Public Health, the cost of which is also known.

Effectiveness of Emergency Operations

Two procedures will be implemented to gauge the effectiveness of emergency operations. The first will determine the overall effectiveness of the operations, the second, the effectiveness of several emergency techniques employed by fire brigades:

1st Indicator: measurement of overall effectiveness by comparison of annual ratios of:

— the number of victims who died during transportation to the number of victims assisted.

2nd Indicator: comparison of annual ratios of:

— the number of victims revived to the total number of victims;

— the number of fractures immobilized to the total number of victims.

On these bases, the SNPC was able to compare its method with that of Group No. 3 which, in principle, was to lend it methodological support.

In the course of the work it became apparent that the efficiency indicator proposed are, advantageous in that it can be applied to all aspects of fire brigade operations, had the disadvantage of being general and this could mean that the activities of the fire brigade could be considered ineffective whereas only the seriousness of the victim's condition when the emergency services arrived accounted for the unavoidable failure of life-preserving efforts.

The indices developed by the SNPC are advantageous in that they include both general criteria and multiple sectoral indices, the latter compensating for the imperfection of the first criteria.

In the final analysis, after one year's work, we may consider that with regard to RBO studies, the SNPC has set about making up for the delay it experienced by making comparison with other ministerial branches, particularly the Ministry of Equipment and the Ministry of the Armed Forces.

In the 1970, an RBO study on civil defence in

wartime will be conducted in close liaison with the Ministry of the Armed Forces which has a team which may serve as a model for SNPC specialists.

In July, 1969, Mr. Francis Raoul, Prefect, General Director of the SNPC, outlined the policy he will implement during the forthcoming year:

"The decision to embark on operations for the rationalization of budgetary options, made by the Government in March, 1968, upon the proposal of the Minister of Finance, prompted me to orientate the SNPC towards the implementation of these techniques which consist of basing requests for funds on cost-effectiveness studies. This new budgetary presentation will culminate in a re-examination of services already voted, at an interministerial discussion of missions, objectives and purposes which will make it possible to eliminate overlapping and to select the least costly and most effective means within the framework of a five-year programme.

From July, 1968, to July, 1969, the SNPC:

1. Drew up a programme structure for civil defence in peacetime which rests on two programme categories: prevention and emergency services, each category grouping programme elements;
2. Determined methods which will make it possible to form a statistical data bank on the costs and effectiveness of the emergency and firefighting services during four sessions attended by 80% of the fire service inspectors;
3. Estimated the evolution of economic losses resulting from accidents and disasters and the increase in fire brigade operations for the 1971-1975 period;
4. Measured the shortage of professional personnel, equipment and space in the light of standards set by the decree of the Secretary of State for the Interior on February 24, 1969 concerning equipping of fire brigades.

The progress achieved in 1968-1969 must be continued in 1969-1970 with the co-operation of all SNPC offices, since any re-examination of services already voted will concern them all.

I feel that this new way of presenting the budget can only be effective if service heads submit to the Financial Affairs Bureau of the SNPC, programmes justified by cost-effectiveness studies.

SNPC Bureau and service heads must then familiarize themselves with modern techniques of economic and financial policy which will make these analyses possible.

Fifteen-day courses are being organized by the Planning Branch of the Ministry of Finance specifically for them.

Nevertheless, due to the very limited number of places, and the length of the courses, all SNPC officers will not be able to benefit from them.

They will therefore have to refer to the work of Mr. Geoffroy d'Aumalc on decision programming published by the Presses universitaires de France.

This book describes the techniques to be implemented within the framework of the rationalization of budgetary options.

Finally, although priority has been given during the 1968-1970 period to the implementation of RBO for civil defence in peacetime, commencing September, 1969, I feel it will be necessary to undertake studies with a view to implementing the same measure for civil defence in wartime.

The Technical Advisors and the Chief of Staff of the SNPC will apply the method developed by the Director of the Estimates and Evaluations Centre of the Ministry of National Defence.

They will keep Mr. Deslignes (author) up to date on progress in this area. Mr. Deslignes will closely follow for me all matters concerning implementation of RBO in close liaison with the Inspectorate-General of Civil Defence which will be responsible for introducing new methods of inspection based on research into minimum cost and maximum effectiveness of SNPC services."

Mr. Raoul's directives will result in the implementation of a civil defence programme structure comprising two major programmes: one for peacetime, the other for wartime. Only the first has been dealt with in the proposal outlined below.

Civil Defence Programme in Peacetime

Mission

Civil defence is intended to ensure the protection of persons and property under all circumstances (peacetime, wartime).

Objectives

To lessen risks through preventive measures, to decrease the cost of accidents through improved organization of emergency services, to obtain greater effectiveness at minimum cost by furthering research into cost-effectiveness.

Purposes

To prevent:

— fire
— asphyxiation
— drownings and aquatic accidents
— highway accidents
— mountain accidents
— cave accidents
— work accidents
— water and sea pollution
— air pollution.

Intentions

— to further the organization of emergency measures and the forecasting of risks, economic losses, and emergency services operations;
— to develop and perfect national and departmental emergency programmes and, generally perfect methods of forecasting;
— to promote a policy governing personnel, equipment, barracks and lodging which will improve emergency organization;
— to apply data processing to accident prevention, forecasting, emergency measures organization and administration of the SNPC central and district services.

Determination of Means and Costs

Determination of Means:

- preventive, studies and research means: programme elements;
- economic, financial, technical and statistical forecasting means: programme elements;
- emergency organization means: programme elements;

Break-down of programme elements in:

- training means (teaching);
- personnel means (recruitment);
- materiel means (equipment);
- accomodation means (barracks, lodgings);
- financial means (national, regional, departmental) Pluri-annual financial plan encompassing both investment and operational means.

Cost Determination:

- costs per person at the national, regional, departmental and communal level;
- costs per incident and per type of incident at the national, regional, departmental and communal level.

Programme Sub-Categories:

(1) fires
(2) asphyxiations
(3) drownings
(4) sundry operations
(5) work accidents
(6) highway accidents
(7) air, sea, water pollution.

Choice of Means

Means will be selected after completion of cost-effectiveness studies related to the programme sub-categories and elements. Examples of research into effectiveness:

- effectiveness of prevention
- effectiveness of ORSEC (Emergency Organization) plans and of forecasting
- effectiveness of emergency action.

Pluri-Annual Financial Plan (5-year)

This plan will combine all data assembled for preparation fo the 6th Civil Defence Plan (estimate of evolution over a five-year period of risks, losses, operations, means of protection, economic and financial costs).

The result of the cost-effectiveness studies will serve as the basis for re-examining the conventional 6th Plan with a view to a new interministerial definition of the missions, objectives and purposes of the SNPC in peacetime.

Programme Memorandum

A ministerial instruction implementing the rationalization of budgetary options in the Central Administration and in the district services of the SNPC with emphasis on minimum cost and maximum effectiveness.

This programme memorandum will be drawn up with the co-operation of the departmental fire and emergency services inspectors who will be responsible for its implementation.

Sessions for Mayors, councillors, firemen and members of the administrative commissions of the fire and emergency services will make those concerned aware of the problems posed by the rationalization of budgetary options in an area where 95% of the funds originate from local governments.

Efficiency Indicators

To check the results obtained by application of the memorandum, and to permit annual revision for the purpose of obtaining greater effectiveness, efficiency indicators have been introduced.

A. Efficiency Criteria for Emergency Services and Teaching

EFFECTIVENESS OF EMERGENCY SERVICES

Firemen's Emergency Service

Its effectiveness will be measured by annual evaluation of the following ratios:

1. Number of asphyxiated persons revived: number of asphyxiation incidents;
2. Number of persons revived: number of incidents (excluding late calls and persons dead of asphyxiation before arrival of fire brigade;
3. Number of persons revived orally: number of persons revived by manual artificial respiration methods (outmoded methods which should be eliminated for greater effectiveness);

4. Number of effective heart massages: number of heart massages performed under proper conditions (in a reasonable length of time).

These efficiency criteria will distinguish the overall effectiveness of the Paris Fire Brigade, the Bataillon of Naval Firemen of Marseille and the Lyon Fire Brigade in order to assess the comparative effectiveness of these corps.

C.R.S. Emergency Service (Drownings)

Its effectiveness will be measured by the annual evolution of the following ratios:

1. Number of persons revived: number of incidents when revival possible;
2. Number of persons revived orally: number of persons revived by manual methods (to be eliminated);
3. Number of effective heart massages: number of heart massages performed on drowned persons under proper conditions

Emergency Service by General Population

Its effectiveness will be measured by the annual evolution in the following ratios:

— asphyxiation: number of persons revived by rescuers before arrival of fire brigade compared to number of persons asphyxiated;

— effectiveness of highway first aid associations:

This will be measured by evolution in the ratios:

1. Number of revivals of highway accident victims: number of persons injured on the highway;
2. Number of skull fractures and fractures of the spinal column immobilized: number of highway victims;

— the effectiveness of SNPC teaching (national schools, regional centres) will become apparent from these observations; teaching may then be revised for greater effectiveness.

The cost of effectiveness will be measured by comparing costs and gains (number of deaths prevented, or injuries not aggravated through improper handling).

B. Criteria for Measuring the Technical Effectiveness of Emergency Services

Effectiveness of Fire Protection

(1) Effectiveness of prevention

General Criterion: The criterion used will be based on the annual recorded number of incidents. An increase in the growth-rate will denote failure of preventive measures. A decrease, greater effectiveness of prevention.

Sectoral Criteria: These will consist of measuring the annual evolution in the causes of fires. A decrease will denote greater effectiveness of preventive measures. An increase will signify failure of prevention.

(2) Effectiveness of Emergency Organization and Forecasting

General Criterion:

- Evolution of ratio
  fires causing more than 100,000 F damage
  number of fires;
- Evolution of ratio
  fires involving more than 5 reels
  number of fires.

Time Criterion:

- Time between start of fire and alert
- Time taken by fire brigade in leaving
- Time taken by fire brigade in arriving
- Time at site.

Financial Criterion:

- Average cost per minute of fires of more than one hour in duration, more than two hours, etc.
- Cost of fire compared to gross national product and average hourly wage.

Effectiveness of Highway Assistance

(1) Effectiveness of Prevention

General Criterion: This will rest on the recorded annual number of highway assistance incidents. An increase in the rate of growth will indicate failure of the preventive measures; a decrease, greater effectiveness of prevention.

(2) Effectiveness of Highway Assistance Organization

General Criterion:

- Evolution of ratio:
  number of deaths
  number of accidents
- Evolution of ratio:
  number of deaths
  number of injured

Time Criterion:

- Time between accident and receipt of alert;
- Time taken by fire brigade in leaving;
- Time taken by fire brigade in arriving;
- Time at site;
- Time taken to convey victim to hospital.

EFFECTIVENESS OF AID TO ASPHYXIATED PERSONS

(*1*) *Effectiveness of Prevention:*

General Criterion: Measure of annual rate of increase of incidents. A decrease will indicate greater effectiveness of preventive measures.

(*2*) *Effectiveness of Aid*

General Criterion:

- number of asphyxiated persons who died
  number of asphyxiated persons
- number of asphyxiated persons revived
  number of asphyxiated persons

Time Criterion:

Cf. highway assistance

C. Criteria of Economic Effectiveness

- *1st criterion:*
  number of persons rescued x cost of human life
  cost of relief services.
- *2nd criterion:*
  economic losses owing to accidents and disasters
  gross national product.
- *3rd criterion:*
  losses:
  number of inhabitants;
  cost of services:
  number of inhabitants.
- *4th criterion:*
  losses compared to average hourly wage

Cost-Effectiveness Comparisons

Taking into account cost structures and efficiency indicators.

Revision of SNPC programme memorandum on basis of cost-effectiveness comparisons.

Revision of Civil Defence Plan (revision of hypothesis A, B or C; new simulated management of hypotheses which become A^1, B^1 or C^1.)

After a year's study, such is the SNPC's achievement with regard to RBO implementation. The first stage, that of making the supervisory staff aware of the problems, has been completed and the second, that of readaptation of the supervisory staff responsible for implementing this new technique of economic and financial policy will be undertaken in 1970 in close co-operation with the General Director of the Financial Affairs and Common Services Branch of the Ministry of the Interior who heads all the activities involved in guiding the Ministry as a whole in PPBS techniques. ▲

WHAT WE MUST DO

A large-scale mobilization of scientists may be the only way to solve our crisis problems.

*John Platt**

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There is only one crisis in the world. It is the crisis of transformation. The trouble is that it is now coming upon us as a storm of crisis problems from every direction. But if we look quantitatively at the course of our changes in this century, we can see immediately why the problems are building up so rapidly at this time, and we will see that it has now become urgent for us to mobilize all our intelligence to solve these problems if we are to keep from killing ourselves in the next few years.

The essence of the matter is that the human race is on a steeply rising "S-curve" of change. We are undergoing a great historical transition to new levels of technological power all over the world. We all know about these changes, but we do not often stop to realize how large they are in orders of magnitude, or how rapid and enormous compared to all previous changes in history. In the last century, we have increased our speeds of communication by a factor of 10); our speeds of travel by 10); our speeds of data handling by 10); our energy resources by 10); our power of weapons by 10); our ability to control diseases by something like 10); and our rate of population growth to 10) times what it was a few thousand years ago.

Could anyone suppose that human relations around the world would not be affected to their very roots by such changes? Within the last 25 years, the Western world has moved into an age of jet planes, missiles and satellites, nuclear power and nuclear terror. We have acquired computers and automation, a service and leisure economy, superhighways, superagriculture, supermedicine, mass higher education, universal TV, oral contraceptives, environmental pollution, and urban crises. The rest of the world is also moving rapidly and may catch up with all these powers and problems within a very short time. It is hardly surprising that young people under 30, who have grown up familiar with these things from childhood, have developed very different expectations and concerns from the older generation that grew up in another world.

What many people do not realize is that many of these technological changes are now approaching certain natural limits. The "S-curve" is beginning to level off. We may never have faster communications or more TV or larger weapons or a higher level of danger than we have now. This means that if we could learn how to manage these new powers and problems in the next few years without killing ourselves by our obsolete structures and behavior, we might be able to create new and more effective social structures that would last for many generations. We might be able to move into that new world of abundance and diversity and well-being for all mankind which technology has now made possible.

The trouble is that we may not survive these next few years. The human race today is like a rocket on a launching pad. We have been building up to this moment of takeoff for a long time, and if we can get safely through the takeoff period, we may fly on a new and exciting course for a long time to come. But at this moment, as the powerful new engines are fired, their thrust and roar shakes and stresses every part of the ship and may cause the whole thing to blow up before we can steer it on its way. Our problem today is to harness and direct these tremendous new forces through this dangerous transition period to the new world instead of to destruction. But unless we can do this, the rapidly increasing strains and crises of the next decade may kill us all. They will make the last 20 years look like a peaceful interlude.

The Next 10 Years

Several types of crisis may reach the point of explosion in the next 10 years: nuclear escalation, famine, participatory crises, racial crises, and what have been called the crises of administrative legitimacy. It is worth singling out two or three of these to see how imminent and dangerous they are, so that we can fully realize how very little time we have for preventing or controlling them.

Take the problem of nuclear war, for example. A few years ago, Leo Szilard estimated the "half-life" of the human race with respect to nuclear escalation as being between 10 and 20 years. His reasoning then is still valid now. As long as we continue to have no adequate stabilizing peace-keeping structures for the world, we continue to live under the daily threat not only of local wars but of nuclear escalation with overkill and megatonnage enough to destroy all life on earth. Every year or two there is a confrontation between nuclear powers—Korea, Laos, Berlin, Suez,

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Quemoy, Cuba, Vietnam, and the rest. MacArthur wanted to use nuclear weapons in Korea; and in the Cuban missile crisis, John Kennedy is said to have estimated the probability of a nuclear exchange as about 25 percent.

The danger is not so much that of the unexpected, such as a radar error or even a new nuclear dictator, as it is that our present systems will work exactly as planned!—from border testing, strategic gambles, threat and counterthreat, all the way up to that "second-strike capability" that is already aimed, armed, and triggered to wipe out hundreds of millions of people in a 3-hour duel!

What is the probability of this in the average incident? 10 percent? 5 percent? There is no average incident. But it is easy to see that five or ten more such confrontations in this game of "nuclear roulette" might indeed give us only a 50-50 chance of living until 1980 or 1990. This is a shorter life expectancy than people have ever had in the world before. All our medical increases in length of life are meaningless, as long as our nuclear lifetime is so short.

Many agricultural experts also think that within this next decade the great famines will begin, with deaths that may reach 100 million people in densely populated countries like India and China. Some contradict this, claiming that the remarkable new grains and new agricultural methods introduced in the last 3 years in Southeast Asia may now be able to keep the food supply ahead of population growth. But others think that the reeducation of farmers and consumers to use the new grains cannot proceed fast enough to make a difference.

But if famine does come, it is clear that it will be catastrophic. Besides the direct human suffering, it will further increase our international instabilities, with food riots, troops called out, governments falling, and international interventions that will change the whole political map of the world. It could make Vietnam look like a popgun.

In addition, the next decade is likely to see continued crises of legitimacy of all our overloaded administrations, from universities and unions to cities and national governments. Everywhere there is protest and refusal to accept the solutions handed down by some central elite. The student revolutions circle the globe. Suburbs protest as well as ghettoes, Right as well as Left. There are many new sources of collision and protest, but it is clear that the general problem is in large part structural rather than political. Our traditional methods of election and management no longer give administrations the skill and capacity they need to handle their complex new burdens and decisions. They become swollen, unresponsive—and repudiated. Every day now some distinguished administrator is pressured out of office by protesting constituents.

In spite of the violence of some of these confrontations, this may seem like a trivial problem compared to war or famine—until we realize the dangerous effects of these instabilities on the stability of the whole system. In a nuclear crisis or in any of our other crises today, administrators or negotiators may often work out some basis of agreement between conflicting groups or nations, only to find themselves rejected by their people on one or both sides, who are then left with no mechanism except to escalate their battles further.

The Crisis of Crises

What finally makes all of our crises still more dangerous is that they are now coming on top of each other. Most administrations are able to endure or even enjoy an occasional crisis, with everyone working late together and getting a new sense of importance and unity. What they are not prepared to deal with are multiple crises, a crisis of crises all at one time. This is what happened in New York City in 1968 when the Ocean Hill-Brownsville teacher and race strike was combined with a police strike, on top of a garbage strike, on top of a longshoremen's strike, all within a few days of each other.

When something like this happens,the staffs get jumpy with smoke and coffee and alcohol, the mediators become exhausted, and the administrators find themselves running two crises behind. Every problem may escalate because those involved no longer have time to think straight. What would have happened in the Cuban missile crisis if the East Coast power blackout had occurred by accident that same day? Or if the "hot line" between Washington and Moscow had gone dead? There might have been hours of misinterpretation, and some fatally different decisions.

I think this multiplication of domestic and international crises today will shorten that short half-life. In the continued absence of better ways of heading off these multiple crises, our half-life may no longer be 10 or 20 years, but more like 5 to 10 years, or less. We may have even less than a 50-50 chance of living until 1980.

This statement may seem uncertain and excessively dramatic. But is there any scientist who would make a much more optimistic estimate after considering all the different sources of danger and how they are increasing? The shortness of the time is due to the exponential and multiplying character of our problems and not to what particular numbers or guesses we put in. Any one who feels more hopeful about getting past the nightmares of the 1970's has only to look beyond them to the monsters of pollution and population rising up in the 1980's and 1990's. Whether we have 10 years or more like 20 or 30, unless we systematically find new largescale solutions, we are in the gravest danger of destroying our society, our world, and ourselves in any of a number of different ways well before the end of this century. Many futurologists who have predicted what the world will be like in the year 2000 have neglected to tell us that.

Nevertheless the real reason for trying to make rational estimates of these deadlines is not because of their shock value but because they give us at least a rough idea of how much time we may have for finding

and mounting some large-scale solutions. The time is short but, as we shall see, it is not too short to give us a chance that something can be done, if we begin immediately.

From this point, there is no place to go but up. Human predictions are always conditional. The future always depends on what we do and can be made worse or better by stupid or intelligent action. To change our earlier analogy, today we are like men coming out of a coal mine who suddenly begin to hear the rock rumbling, but who have also begun to see a little square of light at the end of the tunnel. Against this background, I am an optimist—in that I want to insist that there is a square of light and that it is worth trying to get to. I think what we must do is to start running as fast as possible toward that light, working to increase the probability of our survival through the next decade by some measurable amount.

For the light at the end of the tunnel is very bright indeed. If we can only devise new mechanisms to help us survive this round of terrible crises, we have a chance of moving into a new world of incredible potentialities for all mankind. But if we cannot get through this next decade, we may never reach it.

Task Forces for Social Research and Development

What can we do? I think that nothing less than the application of the full intelligence of our society is likely to be adequate. These problems will require the humane and constructive efforts of everyone involved. But I think they will also require something very similar to the mobilization of scientists for solving crisis problems in wartime. I believe we are going to need large numbers of scientists forming something like research teams or task forces for social research and development. We need full-time interdisciplinary teams combining men of different specialties, natural scientists, social scientists, doctors, engineers, teachers, lawyers, and many other trained and inventive minds, who can put together our stores of knowledge and powerful new ideas into improved technical methods, organizational designs, or "social inventions" that have a chance of being adopted soon enough and widely enough to be effective. Even a great mobilization of scientists may not be enough. There is no guarantee that these problems can be solved, or solved in time, no matter what we do. But for problems of this scale and urgency, this kind of focusing of our brains and knowledge may be the only chance we have.

Scientists, of course, are not the only ones who can make contributions. Millions of citizens, business and labor leaders, city and government officials, and workers in existing agencies, are already doing all they can to solve these problems. No scientific innovation will be effective without extensive advice and help from all these groups.

But it is the new science and technology that have made our problems so immense and intractable. Technology did not create human conflicts and inequities, but it has made them unendurable. And where science and technology have expanded the problems in this way, it may be only more scientific understanding and better technology that can carry us past them. The cure for the pollution of the rivers by detergents is the use of nonpolluting detergents. The care for bad management designs is better management designs.

Also, in many of these areas, there are few people outside the research community who have the basic knowledge necessary for radically new solutions. In our great biological problems, it is the new ideas from cell biology and ecology that may be crucial. In our social-organizational problems, it may be the new theories of organization and management and behavior theory and game theory that offer the only hope. Scientific research and development groups of some kind may be the only effective mechanism by which many of these new ideas can be converted into practical invention and action.

The time scale on which such task forces would have to operate is very different from what is usual in science. In the past, most scientists have tended to work on something like a 30-year time scale, hoping that their careful studies would fit into some great intellectual synthesis that might be years away. Of course when they become politically concerned, they begin to work on something more like a 3-month time scale, collecting signatures or trying to persuade the government to start or stop some program.

But 30 years is too long, and 3 months is too short, to cope with the major crises that might destroy us in the next 10 years. Our urgent problems now are more like wartime problems, where we need to work as rapidly as is consistent with large-scale effectiveness. We need to think rather in terms of a 3-year time scale—or more broadly, a 1- to 5-year time scale. In World War II, the ten thousand scientists who were mobilized for war research knew they did not have 30 years, or even 10 years, to come up with answers. But they did have time for the new research, design, and construction that brought sonar and radar and atomic energy to operational effectiveness within 1 to 4 years. Today we need the same large-scale mobilization for innovation and action and the same sense of constructive urgency.

Priorities: A Crisis Intensity Chart

In any such enterprise, it is most important to be clear about which problems are the real priority problems. To get this straight, it is valuable to try to separate the different problems area according to some measures of their magnitude and urgency. A possible classification of this kind is shown in Tables 1 and 2. In these tables, I have tried to rank a number of present or potential problems or crises, vertically, according to an estimate of their order of intensity or "seriousness," and horizontally, by a rough estimate of their time to reach climatic importance. Table 1 is such a classifica-

tion for the United States for the next 1 to 5 years, the next 5 to 20 years, and the next 20 to 50 years. Table 2 is a similar classification for world problems and crises.

The successive rows indicate something like order-of-magnitude differences in the intensity of the crises, as estimated by a rough product of the size of population that might be hurt or affected, multiplied by some estimated average effect in the disruption of their lives. Thus the first row corresponds to total or near-total annihilation; the second row, to great destruction or change affecting everybody; the third row, to a lower tension affecting a smaller part of the population or a smaller part of everyone's life, and so on.

Informed men might easily disagree about one row up or down in intensity, or one column left or right in the time scales, but these order-of-magnitude differences are already so great that it would be surprising to find much larger disagreements. Clearly, an important initial step in any serious problem study would be to refine such estimates.

In both tables, the one crisis that must be ranked at the top in total danger and imminence is, of course, the danger of large-scale or total annihilation by nuclear escalation or by radiological-chemical-biological-warfare (RCBW). This kind of crisis will continue through both the 1- to 5-year time period and the 5- to 20-year period as Crisis Number 1, unless and until we get a safer peace-keeping arrangement. But in the 20- to 50-year column, following the reasoning already given, I think we must simply put a big "+" at this level, on the grounds that the peace-keeping stabilization problem will either be solved by that time or we will probably be dead.

At the second level, the 1- to 5-year period may not be a period of great destruction (except nuclear) in either the United States or the world. But the problems at this level are building up. and within the 5- to 20-year period, many scientists fear the destruction of our whole biological and ecological balance in the United States by mismanagement or pollution. Others fear

TABLE 1. Classification of problems and crises by estimated time and intensity (United States).

Grade	Estimated crisis intensity (number affected × degree of effect)		Estimated time to crisis*		
			1 to 5 years	5 to 20 years	20 to 50 years
1.		Total annihilation	Nuclear or RCBW escalation	Nuclear or RCBW escalation	+ (Solved or dead)
2.	10^8	Great destruction or change (physical, biological, or political)	(Too soon)	Participatory democracy Ecological balance	Political theory and economic structure Population planning Patterns of living Education Communications Integrative philosophy
3.	10^7	Widespread almost unbearable tension	Administrative management Slums Participatory democracy Racial conflict	Pollution Poverty Law and justice	?
4.	10^6	Large-scale distress	Transportation Neighborhood ugliness Crime	Communication gap	?
5.	10^5	Tension producing responsive change	Cancer and heart Smoking and drugs Artificial organs Accidents Sonic boom Water supply Marine resources Privacy on computers	Educational inadequacy	?
6.		Other problems—important, but adequately researched	Military R & D New educational methods Mental illness Fusion power	Military R & D	
7.		Exaggerated dangers and hopes	Mind control Heart transplants Definition of death	Sperm banks Freezing bodies Unemployment from automation	Eugenics
8.		Noncrisis problems being "overstudied"	Man in space Most basic science		

*If no major effort is made at anticipatory solution.

political catastrophe within this period, as a result of participatory confrontations or backlash or even dictatorship, if our divisive social and structural problems are not solved before that time.

On a world scale in this period, famine and ecological catastrophe head the list of destructive problems. We will come back later to the items in the 20- to 50-year column.

The third level of crisis problems in the United States includes those that are already upon us: administrative management of communities and cities, slums, participatory democracy, and racial conflict. In the 5- to 20-year period, the problems of pollution and poverty or major failures of law and justice could escalate to this level of tension if they are not solved. The last column is left blank because secondary events and second-order effects will interfere seriously with any attempt to make longer-range predictions at these lower levels.

The items in the lower part of the tables are not intended to be exhaustive. Some are common headline problems which are included simply to show how they might rank quantitatively in this kind of comparison. Anyone concerned with any of them will find it a useful exercise to estimate for himself their order of seriousness, in terms of the number of people they actually affect and the average distress they cause. Transportation problems and neighborhood ugliness, for example, are listed as grade 4 problems in the United States because they depress the lives of tens of millions for 1 or 2 hours every day. Violent crime may affect a corresponding number every year or two. These evils are not negligible, and they are worth the efforts of enormous numbers of people to cure them and to keep them cured—but on the other hand, they will not destroy our society.

The grade 5 crises are those where the hue and cry has been raised and where responsive changes of some kind are already under way. Cancer goes here, along with problems like auto safety and an adequate water supply. This is not to say that we have solved the problem of cancer, but rather that good people are

TABLE 2. Classification of problems and crises by estimated time and intensity (World).

Grade	Estimated crisis intensity (number affected × degree of effect)		Estimated time to crisis*		
			1 to 5 years	5 to 20 years	20 to 50 years
1.	10^{10}	Total annihilation	Nuclear or RCBW escalation	Nuclear or RCBW escalation	∔ (Solved or dead)
2.	10^{9}	Great destruction or change (physical, biological, or political)	(Too soon)	Famines Ecological balance Development failures Local wars Rich-poor gap	Economic structure and political theory Population and ecological balance Patterns of living Universal education Communications-integration Management of world Integrative philosophy
3.	10^{8}	Widespread almost unbearable tension	Administrative management Need for participation Group and racial conflict Poverty-rising expectations Environmental degradation	Poverty Pollution Racial wars Political rigidity Strong dictatorships	?
4.	10^{7}	Large-scale distress	Transportation Diseases Loss of old cultures	Housing Education Independence of big powers Communications gap	?
5.	10^{6}	Tension producing responsive change	Regional organization Water supplies	?	?
6.		Other problems—important, but adequately researched	Technical development design Intelligent monetary design		
7.		Exaggerated dangers and hopes			Eugenics Melting of ice caps
8.		Noncrisis problems being "overstudied"	Man in space Most basic science		

*If no major effort is made at anticipatory solution.

working on it and are making as much progress as we could expect from anyone. (At this level of social intensity, it should be kept in mind that there are also positive opportunities for research, such as the automation of clinical biochemistry or the invention of new channels of personal communication, which might affect the 20-year future as greatly as the new drugs and solid state devices of 20 years ago have begun to affect the present.)

Where the Scientists Are

Below grade 5, three less quantitative categories are listed, where the scientists begin to outnumber the problems. Grade 6 consists of problems that many people believe to be important but that are adequately researched at the present time. Military R & D belongs in this category. Our huge military establishment creates many social problems, both of national priority and international stability, but even in its own terms, war research, which engrosses hundreds of thousands of scientists and engineers, is being taken care of generously. Likewise, fusion power is being studied at the $100-million level, though even if we had it tomorrow, it would scarcely change our rates of application of nuclear energy in generating more electric power for the world.

Grade 7 contains the exaggerated problems which are being talked about or worked on out of all proportion to their true importance, such as heart transplants, which can never affect more than a few thousands of people out of the billions in the world. It is sad to note that the symposia on "social implications of science" at many national scientific meetings are often on the problems of grade 7.

In the last category, grade 8, are two subjects which I am sorry to say I must call "overstudied," at least with respect to the real crisis problems today. The Man in Space flights to the moon and back are the most beautiful technical achievements of man, but they are not urgent except for national display, and they absorb tens of thousands of our most ingenious technical brains.

And in the "overstudied" list I have begun to think we must now put most of our basic science. This is a hard conclusion, because all of science is so, important in the long run and because it is still so small compared say, to advertising or the tobacco industry. But basic scientific thinking is a scarce resource. In a national emergency, we would suddenly find that a host of our scientific problems could be postponed for several years in favor of more urgent research. Should not our total human emergency make the same claims? Long-range science is useless unless we survive to use it. Tens of thousands of our best trained minds may now be needed for something more important than "science as usual."

The arrows at level 2 in the tables are intended to indicate that problems may escalate to a higher level of crisis in the next time period if they are not solved. The arrows toward level 2 in the last columns of both tables show the escalation of all our problems upward to some general reconstruction in the 20- to 50-year time period, if we survive. Probably no human institution will continue unchanged for another 50 years, because they will all be changed by the crises if they are not changed in advance to prevent them. There will surely be widespread rearrangements in all our ways of life everywhere, from our patterns of society to our whole philosophy of man. Will they be more humane, or less? Will the world come to resemble a diverse and open humanist democracy? Or Orwell's *1984*? Or a post-nuclear desert with its scientists hanged? It is our acts of commitment and leadership in the next few months and years that will decide.

Mobilizing Scientists

It is a unique experience for us to have peacetime problems, or technical problems which are not industrial problems, on such a scale. We do not know quite where to start, and there is no mechanism yet for generating ideas systematically or paying teams to turn them into successful solutions.

But the comparison with wartime research and development may not be inappropriate. Perhaps the antisubmarine warfare work or the atomic energy project of the 1940's provide the closest parallels to what we must do in terms of the novelty, scale, and urgency of the problems, the initiative needed, and the kind of large success that has to be achieved. In the antisubmarine campaign, Blackett assembled a few scientists and other ingenious minds in his "back room," and within a few months they had worked out the "operations analysis" that made an order-of-magnitude difference in the success of the campaign. In the atomic energy work, scientists started off with extracurricular research, formed a central committee to channel their secret communications, and then studied the possible solutions for some time before they went to the government for large-scale support for the great development laboratories and production plants.

Fortunately, work on our crisis problems today would not require secrecy. Our great problems today are all beginning to be world problems, and scientists from many countries would have important insights to contribute.

Probably the first step in crisis studies now should be the organization of intense technical discussion and education groups in every laboratory. Promising lines of interest could then lead to the setting up of part-time or full-time studies and teams and coordinating committees. Administrators and boards of directors might find active crisis research important to their own organizations in many cases. Several foundations and federal agencies already have inhouse research and make outside grants in many of these crisis areas, and they would be important initial sources of support.

But the step that will probably be required in a short time is the creation of whole new centers, perhaps

comparable to Los Alamos or the RANDCorporation, where interdisciplinary groups can be assembled to work full-time on solutions to these crisis problems. Many different kinds of centers will eventually be necessary, including research centers, development centers, training centers, and even production centers for new sociotechnical inventions. The problems of our time—the $100-billion food problem or the $100-billion arms control problem—are no smaller than World War II in scale and importance, and it would be absurd to think that a few academic research teams or a few agency laboratories could do the job.

Social Inventions

The thing that discourages many scientists—even social scientists—from thinking in these research-and-development terms is their failure to realize that there are such things as social inventions, and that they can have largescale effects in a surprisingly short time. A recent study with Karl Deutsch has examined some 40 of the great achievements in social science in this country, to see where they were made and by whom and how long they took to become effective. They include developments such as the following:

Keynesian economics
Opinion polls and statistical sampling
Input-output economics
Operations analysis
Information theory and feedback theory
Theory of games and economic behaviour
Operant conditioning and programmed learning
Planned programming and budgeting (PPB)
Non-zero-sum game theory

Many of these have made remarkable differences within just a few years in our ability to handle social problems or management problems. The opinion poll became a national necessity within a single election period. The theory of games, published in 1946, had become an important component of American strategic thinking by RAND and the Defense Department by 1953, in spite of the limitations of the theory at that time to zero-sum games, with their dangerous bluffing and "brinksmanship." Today, within less than a decade, the PPB management technique is sweeping through every large organization.

This list is particularly interesting because it shows how much can be done outside official government agencies when inventive men put their brains together. Most of the achievements were the work of teams of two or more men, almost all of them located in intellectual centres such as Princeton or the two Cambridges.

The list might be extended by adding commercial social inventions with rapid and widespread effects, like credit cards. And sociotechnical inventions, like computers and automation or like oral contraceptives, which were in widespread use withing 10 years after they were developed. In addition, there are political innovations like the New Deal, which made great changes in our economic life within 4 years, and the pay-as-you-go income tax, which transformed federal taxing power within 2 years.

On the international scene, the Peace Corps, the "hot line," the Test-Ban Treaty, the Antartic Treaty, and the Nonproliferation Treaty were all implemented within 2 to 10 years after their initial proposal. These are only small contributions, a tiny patchwork part of the basic international stabilization system that is needed, but they show that the time to adopt new structural designs may be surprisingly short. Our cliches about "social lag" are very misleading. Over half of the major social innovations since 1940 were adopted or had widespread social effects within less than 12 years—a time as short as, or shorter than, the average time for adoption of technological innovations.

Areas for Task Forces

Is it possible to create more of these social inventions systematically to deal with our present crisis problems? I think it is. It may be worth listing a few specific areas where new task forces might start.

(1) *Peace-keeping mechanisms and feedback stabilization.* Our various nuclear treaties are a beginning. But how about a technical group that sits down and thinks about the whole range of possible and impossible stabilization and peace-keeping mechanisms? Stabilization feedback-design might be a complex modern counterpart of the "checks and balances" used in designing the constitutional structure of the United States 200 years ago. Without our new knowledge today about. feedbacks, group behavior, and game theory, it ought to be possible to design more complex and even more successful structures.

Some peace-keeping mechanisms that might be hard to adopt today could still be worked out and tested and publicized, awaiting a more favorable moment. Sometimes the very existence of new possibilities can change the atmosphere. Sometimes, in a crisis, men may finally be willing to try out new ways and may find some previously prepared plan of enormous help.

(2) *Biotechnology.* Humanity must feed and care for the children who are already in the world, even while we try to level off the further population explosion that makes this so difficult. Some novel proposals, such as food from coal, or genetic copying of champion animals, or still simpler contraceptive methods, could possibly have large-scale effects on human welfare within 10 to 15 year. New chemical, statistical, and management methods for measuring and maintaining the ecological balance could be of very great importance.

(3) *Game theory.* As we have seen, zero-sum game theory has not been too academic to be used for national strategy and policy analysis. Unfortunately, in zero-sum games, what I win, you lose, and what you win, I lose. This may be the way poker works, but it is not the way the world works. We are collectively in a non-

zero-sum game in which we will all lose together in nuclear holocaust or race conflict or economic nationalism, or all win together in survival and prosperity. Some of the many variation of non.zero-sum game theory, applied to group conflict and cooperation, might show us profitable new approaches to replace our sterile and dangerous confrontation strategies.

(4) *Psychological and social theories.* Many teams are needed to explore in detail and in practice how the powerful new ideas of behavior theory and the new ideas of responsive living might be used to improve family life or community and management structures. New ideas of information handling and management theory need to be burned into practical recipes for reducing the daily frustrations of small businesses, schools, hospitals, churches, and town meetings. New economic inventions are needed, such as urban development corporations. A deeper systems analysis is urgently needed to see if there is not some practical way to separate full employment from inflation. Inflation pinches the poor, increases labor-management disputes, and muliplies all our domestic conflicts and our sense of despair.

(5) *Social indicators.* We need new social indicators, like the cost-of-living index, for measuring a thousand social goods and evils. Good indicators can have great "multiplier effects" in helping to maximize our welfare and minimize our ills. Engineers and physical scientists working with social scientists might come up with ingenious new methods of measuring many of these important but elusive parameters.

(6) *Channels of effectiveness.* Detailed case studies of the reasons for success or failure of various social inventions could also have a large multiplier effect. Handbooks showing what channels or mehods are now most effective for different small-scale and large-scale social problems would be of immense value.

The list could go and on. In fact, each study group will have its own pet projects. Why not? Society is at least as complex as, say, an automobile with its several thousand parts. It will probably require as many research-and-development teams as the auto industry in order to explore all the inventions it needs to solve its problems. But it is clear that there are many areas of great potential crying out for brilliant minds and brilliant teams to get to work on them.

Future Satisfactions and Present Solutions

This is an enormous program. But there is nothing impossible about mounting and financing it, if we, as concerned men, go into it with commitment and leadership. Yes, there will be a need for money and power to overcome organizational difficulties and vested interests. But it is worth remembering that the only real source of power in the world is the gap between what is and what might be. Why else do men work and save and plan? If there is some future increase in human satisfaction that we can point to and realistically anticipate, men will be willing to pay something for it and invest in it in the hope of that return. In economics, they pay with money; in politics, with their votes and time and sometimes with their jail sentences and their lives.

Social change, peaceful or turbulent, is powered by "what might be." This means that for peaceful change, to get over some impossible barrier of unresponsiveness or complexity or group conflict, what is needed is an inventive man or group—a "social entrepreneur"—who can connect the pieces and show how to turn the advantage of "what might be" into some present advantage for every participating party. To get toll roads, when highways were hopeless, a legislative-corporation mechanisme was invented that turned the future need into present profits for construction workers and bondholders and continuing profitability for the state and all the drivers.

This principle of broad-payoff anticipatory design has guided many successful social plans. Regular task forces using systems analysis to find payoffs over the barriers might give us such successful solutions much more often. The new world that could lie ahead, with its blocks and malfunctions removed, would be fantastically wealthy. It seems almost certain that there must be many systematic ways for intelligence to convert that large payoff into the profitable solution of our present problems.

The only possible conclusion is a call to action. Who will commit himself to this kind of search for more intenious and fundamental solutions? Who will begin to assemble the research teams and the funds? Who will begin to create those full-time interdisciplinary centers that will be necessary for testing detailed designs and turning them into effective application?

The task is clear. The task is huge. The time is horribly short. In the past, we have had science for intellectual pleasure, and science for the control of nature. We have had science for war. But today, the whole human experiment may hang on the question of how fast we now press the development of science for survival. ▲

THE MILITARY'S ROLE IN CIVIL DEFENCE

by
*Col. Orville L. Parker**

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"Military support of civil defense" means the use of troops, materiel, facilities and other resources of the military services and agencies of the Department of Defense (DOD) in helping state and local authorities meet a civil defense emergency.

Military support of civil defense at the national level has broader implications than it does at state and local levels. At the national level, military support of civil defense includes peacetime functions which are preparatory or administrative. One example is the national fallout shelter survey, which is administered by agencies of the Army and the Navy and the Office of Civil Defense (OCD). The Army's Strategic Communications Command operates and maintains OCD warning and communications nets. Civil Defense supplies are handled by the Defense Supply Agency; OCD publications are stored and issued by The Adjutant General's Office. Many other tasks are performed for OCD by the services and DOD agencies.

Another feature of military support of civil defense is the joint Army-OCD plan to use reservists now assigned to the Army's Individual Ready Reserve. As unpaid volunteers, these men are authorized to assist in civil defense and in military support of civil defense planning and training.

A third important task of military support of civil defense is in the use, marking and stocking of fallout shelters at military installations. And, of course, each service formulates its own plans for the survival of its bases.

Certain general policies and basic principles govern the planning for military support.

First, military assistance will complement and not substitute for civilian participation in civil defense. Plans formulated by both military and civilian authorities must recognize that civilian resources will be the first to be used to meet civilian needs. Military supplies will be used only when they are needed to supplement civilian resources.

Next, military support to civilian authorities in civil defense is an emregency task within the mission of all federal active and reserve military units and defense agencies.

Third, measures that insure continuity of operations, survival of troops and rehabilitation of essential bases will have priority over military support of civil defense.

Finally, planning for military support will be directed toward the most disastrous occurrence: a nuclear assault with minimum warning and under conditions favorable to the attacker.

The Joint Chiefs of Staff controls military support of civil defense for Hawaii, Alaska and Puerto Rico through unified commanders who, in turn, work with local civilian officials, adjutants general and local OCD regions. The secretaries of the Navy and Air Force have been directed by DOD to assist the Army in exercising its civil defense responsibilities in the 48 CONUS states.

The secretary of the Army has directed the Army chief of staff to plan for and provide military support of civil defense within CONUS; the chief of naval operations and the Air Force chief of staff respond to guidance by the Department of the Army. Each does so through subordinate commands, since the Army chief of staff has delegated the planning of military support to the commanding general of Continental Army Command.

The five continental army commanders and the 48 state adjutants general are given detailed instructions and guidance essential to translating policy into operational plans. In order to do so, a great deal of coordination is required among the five army areas and the state adjutants general as they develop their pre-attack military support of civil defense plans.

The "AG concept" of control requires the adjutants general of the continental states to do the detailed preattack planning for military support under the guidance of the five army area commanders. However, each adjutant general remains, until an attack, subordinate to his governor. That command relationship problems have arisen is evidenced by the fact that some 20 percent of state plans for military support operations have not yet been reviewed and approved by army area commanders.

In the event of nuclear attack, or before one if so ordered, the adjutants general and their military support planning staffs are federalized and pass to the command of the local army area commander.

A state area command headquarters of the active Army is authorized to designate subarea commands for military support, but no intermediate headquarters is permitted between the army area headquarters and the state area command. The satte area command does not automatically take control of all active and inactive military forces located within the state. Neither do federalized National Guard forces within a state auto-

continued on page 28 MILITARY'S ROLE

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BLAST SHELTER EFFECTIVENESS AND COST

by

Eugene P. Wigner

Winner of the scientific world's highest accolades, including the Nobel Prize, Eugene P. Wigner, scientist and engineer, directs much of his endless store of interest and energy toward alerting his fellow Americans to the need for a strong civil defense as a basic survival means in the nuclear age. Here he reviews the elements of the blast shelter question and comes to grips with the cold-blooded equation of offensive-defensive cost ratios. (Reprinted from Survive)

The present program of the Office of Civil Defense has two principal objectives:

1. To bring to the public, and especially to those in certain occupations, a better understanding of the effects of nuclear weapons and of the modes of protection against them.
2. To provide protection for the population at large against fallout radiation.

Fallout is caused by nuclear explosions if they take place close to the ground; explosions at high altitudes, such as those of ABM missiles, do not create significant fallout. The fallout radiation emanates from particles of earth and other debris to which the radioactive atoms produced in the explosion have attached themselves. This material first rises in the mushroom cloud accompanying the explosion, then falls, bringing the radioactivity down to the earth. Fallout shelters are designed to protect against radioactivity from these particles.

Protection against the other effects of nuclear explosions is discussed in this article. The most dangerous of such effects are the blast wave and the heat pulse. The present very economical program of the Office of Civil Defense does not include protection against these effects. This protection would be much more costly than the present program, and the effects in question extend over a much smaller area than that covered by the fallout. Nevertheless, blast and heat can destroy countless lives in cities where many people are concentrated in a relatively small area.

The best protection against blast and heat—and the only one which we now envisage—is provided by blast shelters, which also protect against heat and radioactivity. The rather high cost of blast shelters gave rise to the objection that such shelters are purposeless; the enemy can overcome their effect by increasing his arsenal and the size of its explosions. Furthermore, it is said that the enemy can do this at a cost which is lower than the cost of the protection. We shall see that, under the most widely prevailing conditions, this objection is erroneous.

The blast wave itself is described in the article of Hall and Haaland[1]. It is a sudden increase of the air pressure, followed by an intense gust of hot wind. This can hurl a man against a wall or other solid object. It can throw solid objects at him. These are the principal dangers to avoid. In addition, the air pressure itself, if it exceeds 40 psi (pounds per square inch), may result in lung damage; the eardrums will burst at a much lower pressure. However, if a shelter has a 100 psi blast resistance, the area in which those in the shelter are endangered is reduced to about 1 square mile in the case of a 1 MT (megaton) explosion, to about 4 square miles for a 10 MT explosion, to about 9 square miles for a 25 MT explosion. These figures apply if the weapon is an airburst, in which case the effect of fallout—the most widespread effect—becomes negligible. The area of blast damage for ground burst weapons is considerably smaller. Needless to say, a good blast shelter also protects against the heat radiation and all other effects of the explosion.

Many types of blast shelters have been designed and proposed. Some of these serve only as shelters to be used solely, or at least principally, to protect the people against nuclear weapons. A particular example is the tunnel-grid system, the design of which has been developed in some detail by the Oak Ridge National Laboratory. It consists of two parallel sets of tunnels, situated as the avenues and streets of a typical city are. The advantage of such an arrangement is that one can enter the shelter system anywhere and proceed within it to any other part of the system. The husband and father in the business section can walk toward his home and join his wife and children there. Other designs are for multipurpose shelters. These may serve as garages or conduits for utilities in peace and assume the role of shelter only in an emergency. The proper type of shelter will depend on various circumstances, such as the density of population, the need for utility tunnels or garages, etc.

A comparison of the cost of a blast shelter with the cost of a weapon to overcome its protection was given recently in the *Little Harbor Report*. Tjos report presents the conclusions of a committee of the National Academy of Sciences which was convened to study the effectiveness of various civil defense measures. It estimates the cost of a blast shelter with a 100 psi blast resistance as $300 per shelter space. It also estimates how much our government spends for missiles with

[1] *In the Shadow of Ground Zero, by Wm. Cornelius Hall and Carsten M. Haaland.*

various explosive powers. Since it has been variously claimed that the Soviets can produce their most powerful missiles, the so-called SS-9, at a lower price than the U.S. spends for its missiles, we shall use for the cost of the USSR missiles less than half of what our own costs would indicate. We assume that an SS-9 exploded over our country costs $35 to $40 million to the USSR (we pay about $50 million for a weapon of half the explosive power). This will render our conclusions most conservative.

An SS-9, if an air burst, may cover an area of 7 to 9 square miles with a 100 psi overpressure. In case of a ground burst (to produce fallout also), the area becomes 5 to 6½ square miles. For $35 to $40 milliomn one can build 100 psi shelters for 115,000 to 135,000 people. If the 5 to 9 square miles in question contain more than about 125,000 people, the defense is more expensive than the offensive power necessary to overcome it; otherwise, it is cheaper. Only about 15 million of our people live in areas with a population density exceeding this. Thus, even if one uses our adverse cost estimates, one must conclude that only for a small part of our urban population (of about 75 million) does the cost of protection exceed the cost of overcoming the protection. Of course, if humanitarian rather than cost-effectiveness considerations control the decisions, one will try to save lives at almost any cost.

What are, then, the principal limitations of, and valid objections to, blast shelters? The principal limitation is that they protect only the lives of people, not their houses and property. This is a serious limitation—ballistic missile defense is more effective in this regard. In addition, ballistic missile defense can be always on the alert, ready to shoot at incoming missiles. People need time to reach shelter. This last point is particularly serious if the attack comes from submarines: the warning time may be not more than a few minutes. On the other hand, shelters are less subject to obsolescence than the highly sophisticated antiballistic missiles, and technical innovations of the offense are less likely to endanger their effectiveness. They also would support the morale of the people better than the physically more distant, and emotionally and intellectually more remote, active defense. The two could, of course, be combined to give the most effective protection that is possible. ▲

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matically come within the purview of planning undertaken by the state area command.

The wartime mission of the state area command is to plan, coordinate and provide military support of civil defense within the state. The state area command exercises "operational employment"—not command—over the military forces made available by their parent service for military support of civil defense missions.

Each of the military services annually reports to the five army area commanders all active and inactive units, by state, located in the army area and set up under a DOD priority system. Priority I includes those forces with a high probability of availability for civil defense support in the immediate emergency period; Priority II includes those with a lower probability of availability; Priority III includes those least likely to be available.

The service planners realize that attack and post-attack military support will, at best, be difficult. For this reason, the joint basic plan visualizes that support will be provided in two phases: the initial automatic response phase and the follow-on controlled phase.

The initial phase is the attack and first post-attack period, for which no established length of time has been established. This period will be characterized by a lack of information at all military and civil agencies and by limited or complete absence of communications. Military support will be local and decentralized. All military commanders will be assessing their needs for survival, recovery, reconstitution and conduct of military missions.

The follow-on phase begins when communications permit the state area command to coordinate employment of military forces within the state. ▲

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There can be no doubt that this proportion does not allow a balanced overall defence system.

There are a variety of reasons for this disproportion. One of them is that the function of civil emergency planning within the framework of overall defence has not yet been properly recognised. If civil emergency planning is inadequate, the quality of military defence is bound to suffer.

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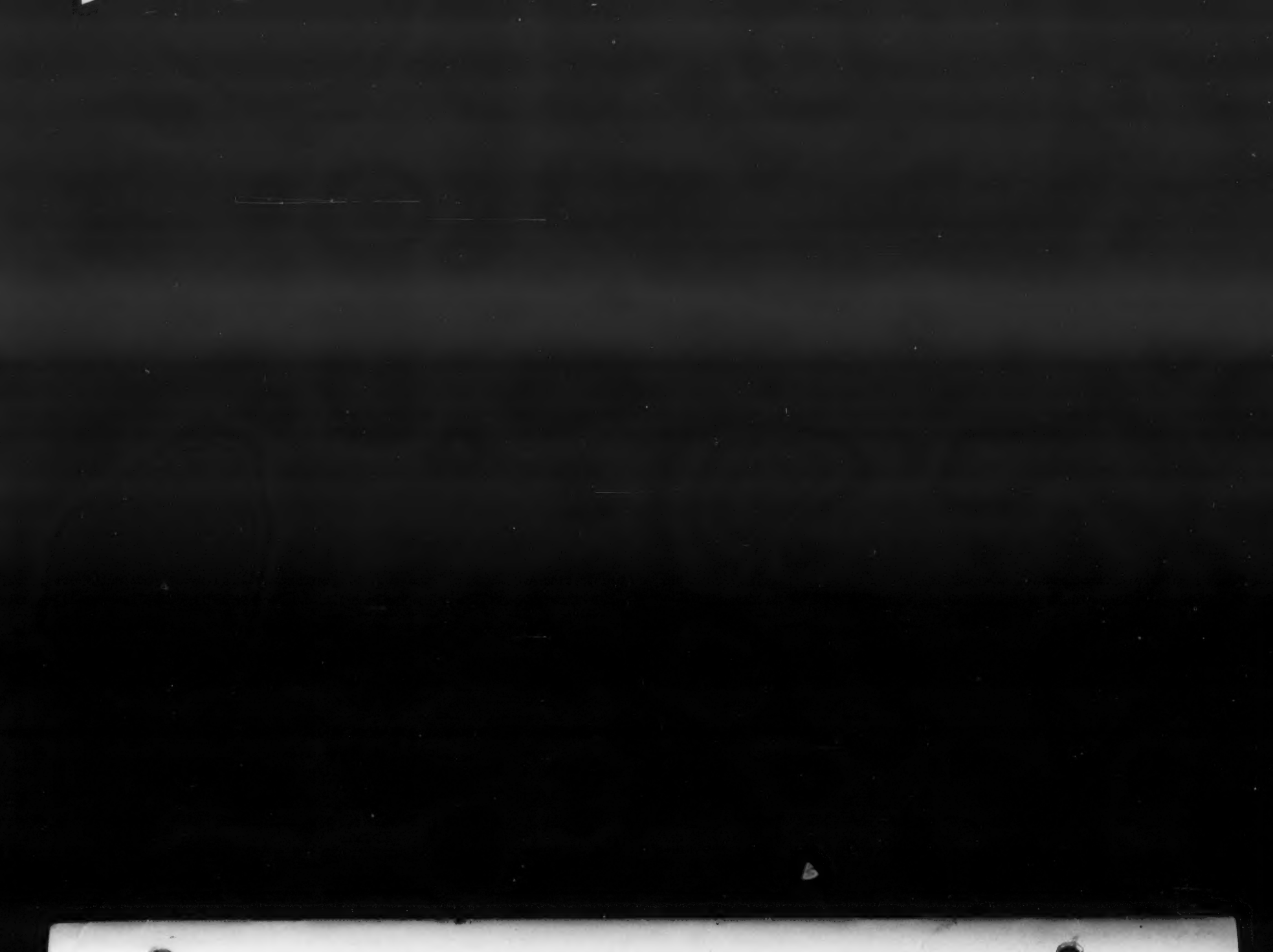
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